



# **Armed Forces College of Medicine**

## **AFCM**



# **Injury of Nerves of the Lower Limb**

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**Professor of Anatomy and Embryology**

## INTENDED LEARNING OBJECTIVES (ILO)



**By the end of this lecture the student will be able to:**

- 1. Recognize causes of femoral and gluteal nerve injury.**
- 2. Predict the sensory and motor defects following femoral and gluteal nerve injury.**
- 3. Recognize causes of sciatic, tibial and common peroneal nerve injury.**
- 4. Predict the sensory and motor defects following sciatic, tibial and common peroneal nerve injury.**

# Lecture Plan



- 1. Part 1 (5 min) Introduction**
- 2. Part 2 (40 min) Main lecture**
- 3. Part 3 (5 min) Summary**

## Key Points

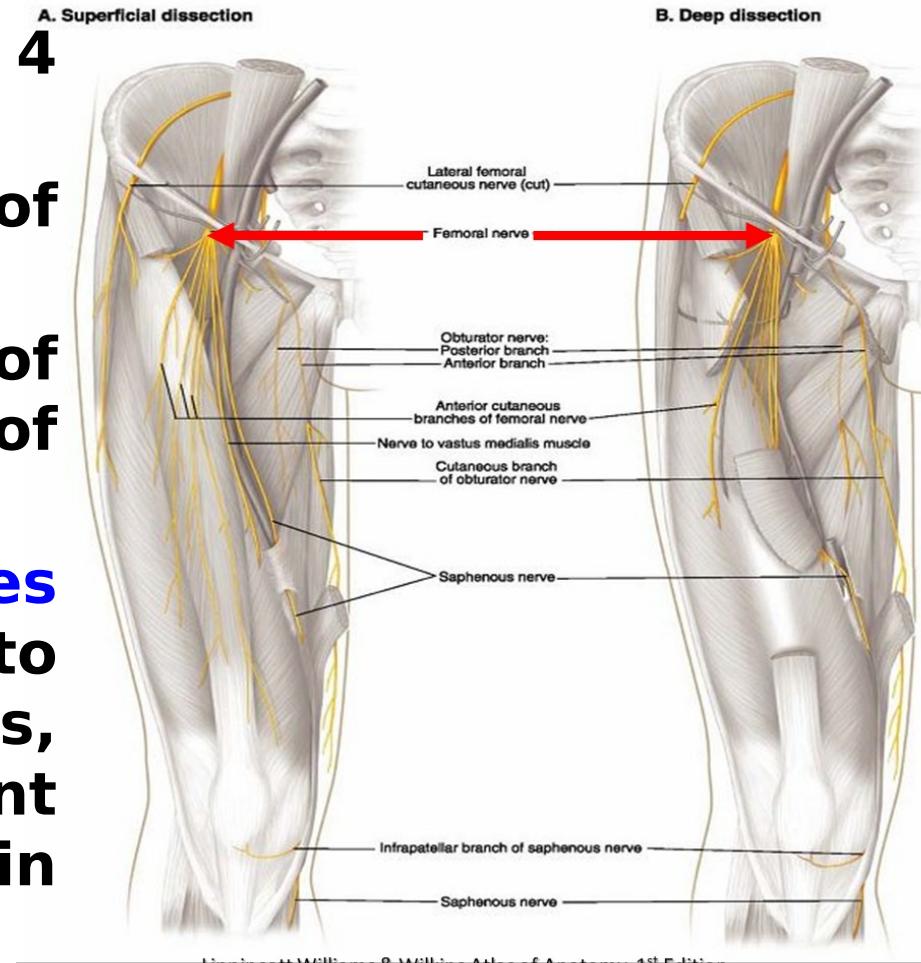


- 1. Causes of femoral and gluteal nerve injury.**
- 2. The sensory and motor defects following femoral and gluteal nerve injury.**
- 3. Causes of sciatic, tibial and common peroneal nerve injury.**
- 4. The sensory and motor defects following sciatic, tibial and common peroneal nerve injury.**

# Femoral Nerve

□ **Femoral nerve: L 2, 3 & 4 dorsal divisions**

- **It is the largest branch of lumbar plexus.**
- **It is main nerve supply of anterior compartment of the thigh.**
- **The femoral nerve gives articular branches to both hip and knee joints, so a lesion in one joint leads to referred pain in the other joint.**



# Femoral Nerve

The femoral nerve can be injured in **stab or gunshot wounds**, but a **complete division of the nerve is rare**.

It leads to:

**Motor effect:** Paralysis of quadriceps femoris muscle → Knee cannot be extended.

**Sensory effect:** Loss of sensation on the anterior and medial sides of the **thigh**, over the **medial side of the lower part of the leg**, and along the **medial border of the foot as far as the ball of the big toe**; this area is normally supplied by the saphenous nerve.

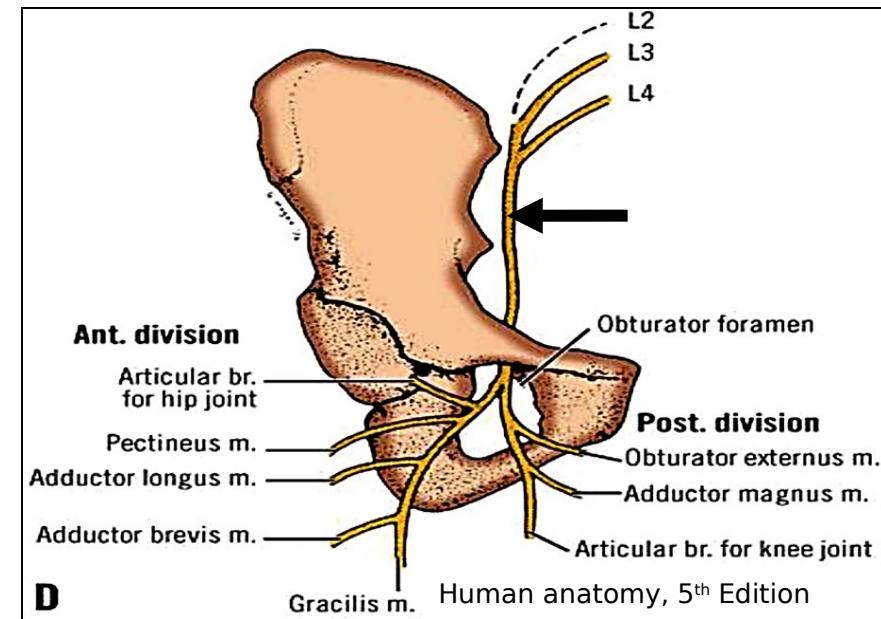


## Sensory distribution

# Obturator Nerve

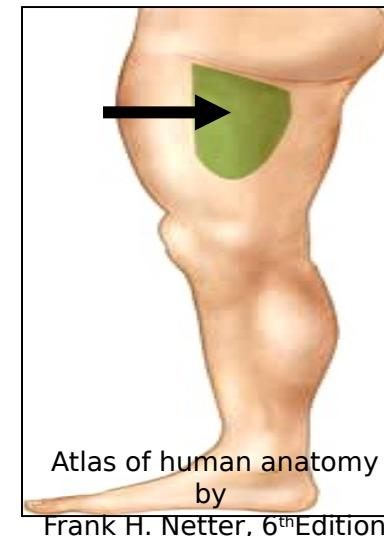
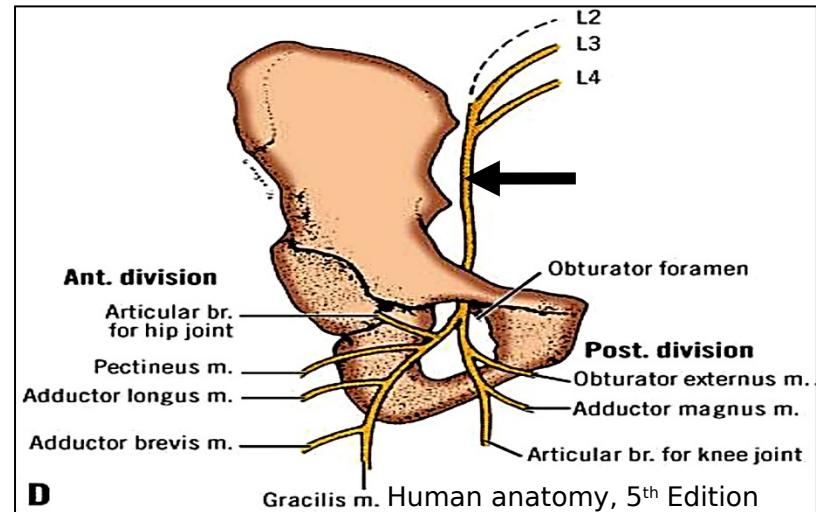
□ **Obturator nerve: L 2, 3 & 4 anterior divisions**

- It is a **branch** of **lumbar plexus**.
- It is **main nerve supply** of the **medial compartment** of the **thigh**.
- **Obturator nerve** also, gives **articular branches** to both **hip** and **knee joints**, so a **lesion** in **one joint**



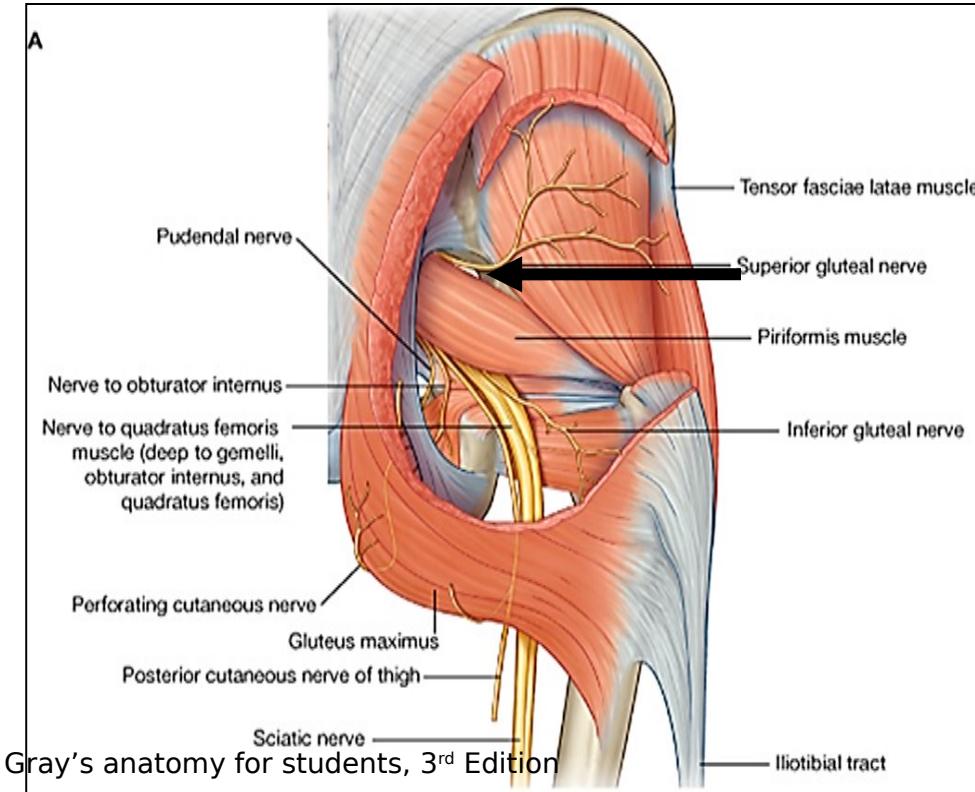
# Obturator Nerve

- Its injury is rare (e.g. fractures of pelvis).
- **Motor effect:** All the adductor muscles are paralyzed **except** the **hamstring part of the adductor magnus**, which is supplied by the **sciatic nerve**.
- **Sensory effect:** Loss of sensation over middle 1/3 of medial side of the thigh.
- **N.B.** Sometimes surgical division of obturator nerve is done to relieve adductors spasm in cases of congenital cerebral diplegia



# Superior Gluteal Nerve

- **Superior gluteal nerve: L 4, 5 S 1**
- It is a **branch of sacral plexus**.
- It enters the gluteal region through greater sciatic foramen **above the piriformis** to supply the **gluteus medius, gluteus minimus and tensor fasciae latae**.



# Superior Gluteal Nerve

• Injury of superior gluteal nerve [e.g. gunshot wounds or fractures of the pelvis] ⇒ Paralysis of the glutei medius and minimus which leads to:

➤ **Lurching gait** in case of unilateral affection.

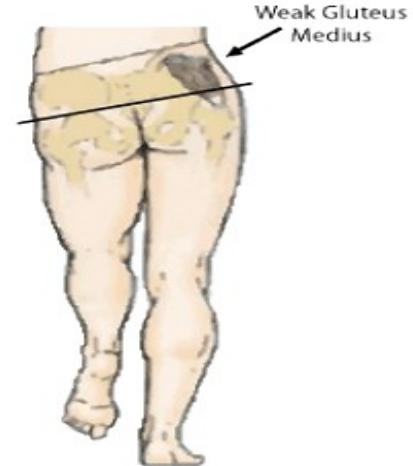
○ The patient complains that in standing on the affected side, the pelvis will tilt towards the unsupported side (**positive Trendelenburg's sign**).

➤ **Waddling gait** in case of bilateral affection.

○ The patient complains that during walking the trunk is flexed from side to side with each step.

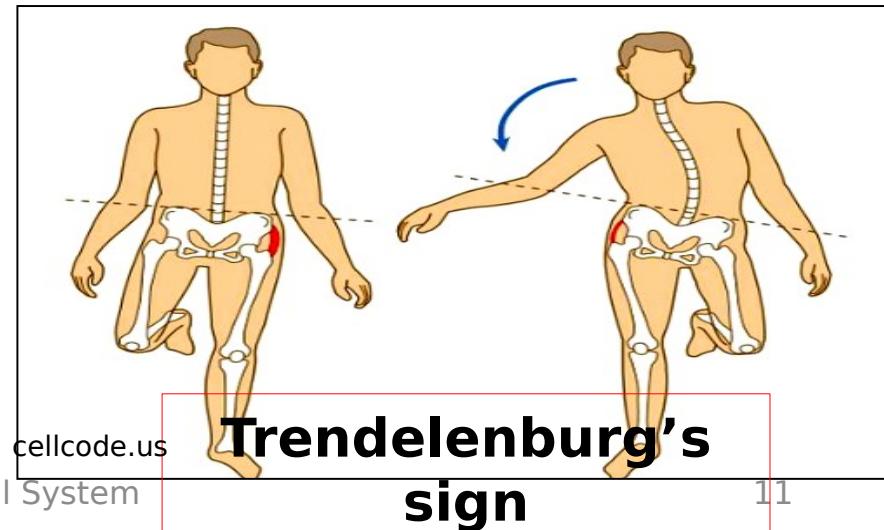


Normal



Trendelenburg Sign  
Drop of pelvis when lifting leg  
opposite to weak gluteus medius

Stanford Medicine 25



# Clinical Cases

1. Following a penetrating injury to the left femoral triangle, a patient complained that walking was virtually impossible because at every step his left knee collapsed into flexion. **This history suggests injury of which nerve?**
2. A 32-year-old man with a tuberculous abscess (localized collection of pus) on the iliopsoas muscle presented with impaired flexion of his thigh and extension of his leg. **Which of the following nerves was involved?**
  - a. Femoral
  - b. Inferior gluteal
  - c. Obturator
  - d. Sciatic
  - e. Superior gluteal

# Clinical Cases

**3."Scissor gait" is a condition in which one limb crosses in front of the other during stepping as a result of powerful hip adduction caused by continuous, unwanted nerve activity. Which nerve is responsible for this condition?**

- a. Femoral**
- b. Obturator**
- c. Sciatic**
- d. Superior gluteal**
- e. Tibial**

# Clinical Cases

4. During recovery from a gunshot wound of the right pelvis, the patient notices a lurch in his gait. When he lifts his left foot off the ground, his pelvis dips down on the left side. **Which nerve is injured in this case?**
- a. Femoral nerve
  - b. Obturator nerve
  - c. Nerve to piriformis
  - d. Sciatic nerve
  - e. Superior gluteal nerve
5. A 45-year-old man has a trouble walking. On examination, when he is asked to stand on his left foot, his right hip drops. **Which is the most likely damaged nerve, causing his problem?**

# **Clinical Cases**

- **Answers of clinical cases from 1-5**

**1. Femoral nerve**

**2. Femoral nerve**

**3. Obturator nerve**

**4. Superior gluteal nerve (right)**

**5. Left superior gluteal nerve**

# Sciatic Nerve

□ **Sciatic nerve: L 4, 5 S 1, 2 & 3 ventral & dorsal divisions**

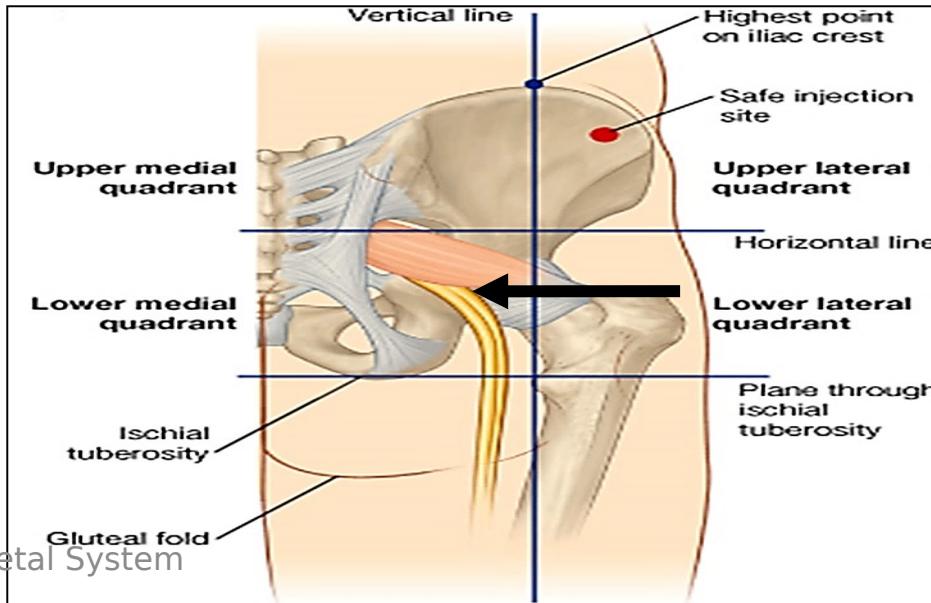
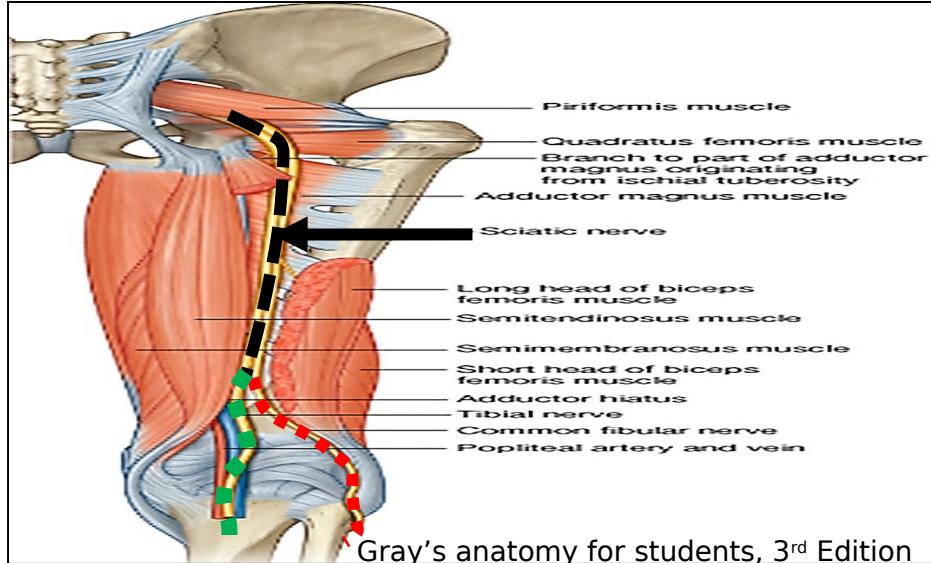
▪ It is the **largest branch of sacral plexus**. It is the **thickest nerve** in the body.

▪ It enters the gluteal region through greater sciatic foramen **below the piriformis** ⇒ back of thigh.

▪ It terminates at **superior angle of the popliteal fossa** by dividing into **2 terminal branches**:

➤ **Tibial nerve [L 4, 5 S 1, 2 & 3 ventral divisions]**

➤ **Common peroneal nerve [L 4, 5 S 1, 2 dorsal divisions]**



# Sciatic Nerve

## □ N.B.

- Sciatic nerve may be **absent**, in this case **tibial nerve** leaves the pelvis **below** the piriformis while **common peroneal nerve pierces** the piriformis.

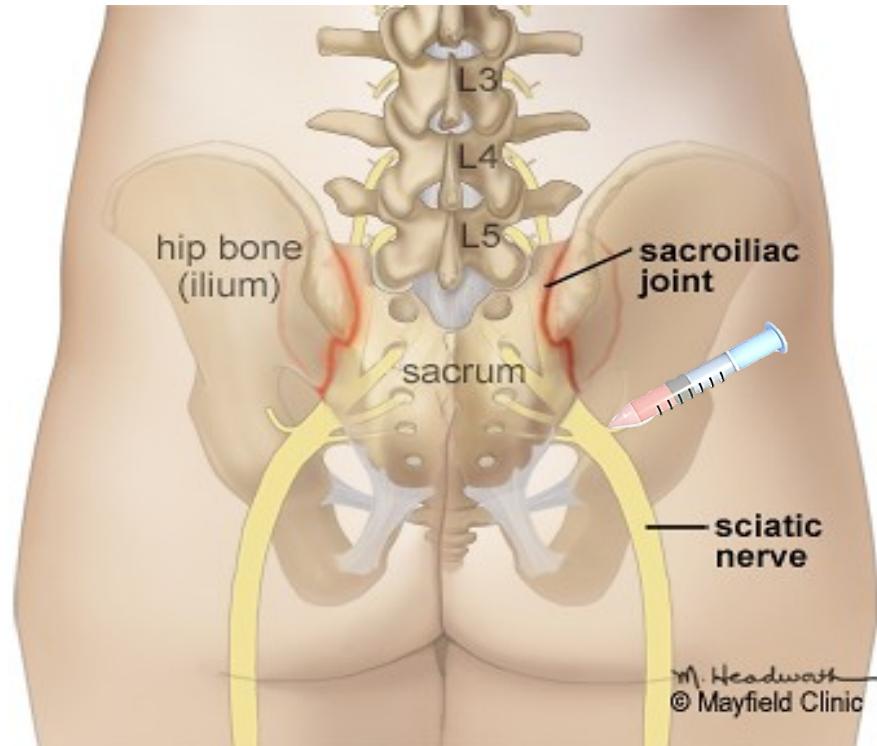
## □ Applied anatomy:

- **Compression of sciatic nerve** against the femur after sitting for a long time may result in tingling sensation (**sleeping foot**).
- **Shooting pain** along the **cutaneous distribution** of sciatic nerve and its **terminal branches** (mainly the **common peroneal nerve**) is known as **sciatica**.



# Sciatic Nerve

- Sciatic nerve may be injured due to **misplaced intramuscular injection** in the lower medial quadrant of the gluteal region, (the **upper lateral quadrant** is the **safest area** for intramuscular injection).
- Also, sciatic nerve may be injured by penetrating wounds, fractures of the pelvis or posterior dislocation of the hip joint.



# Sciatic Nerve

**Effect of injury of sciatic nerve:**

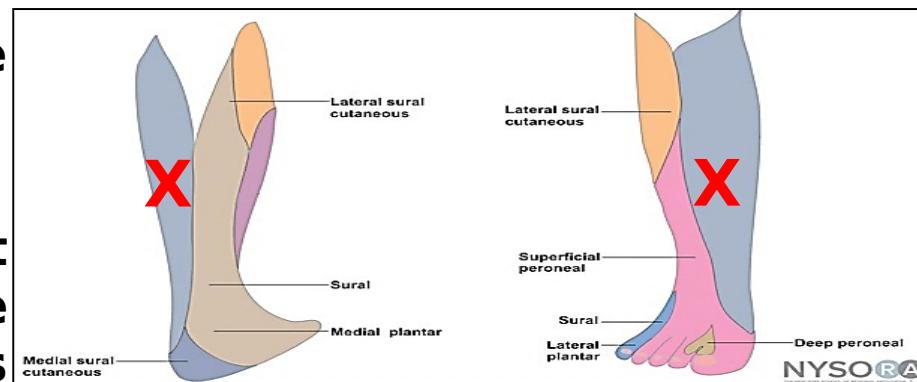
**Motor effect:**

Hamstring muscles are paralyzed, but **weak flexion** of the knee is possible because of the action of sartorius (femoral nerve) and gracilis (obturator nerve).

All the muscles below the knee are paralyzed.

**Deformity: Foot drop**

**Sensory loss:** Sensation is lost below the knee **except** the area supplied by saphenous nerve.



# Common Peroneal Nerve

Common peroneal nerve: L 4, 5 S 1, 2 dorsal divisions

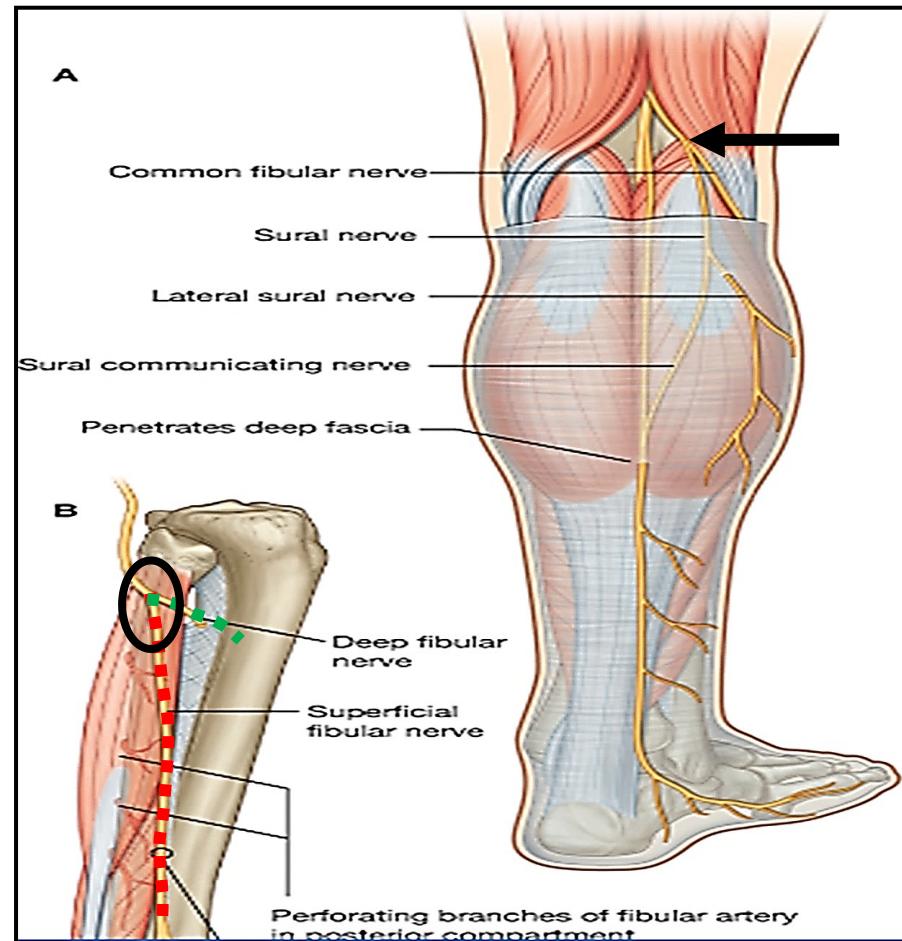
It is the **smaller** of the 2 terminal branches of sciatic nerve.

It is the nerve of **lateral and anterior compartments** of the leg and dorsum of the foot.

It terminates **deep** to peroneus longus, on lateral side of the **neck of fibula** by dividing into:

a Superficial peroneal (musculo-cutaneous) nerve

b Deep peroneal (anterior tibial) nerve



Gray's anatomy for students, 3<sup>rd</sup> Edition

# Common Peroneal Nerve

## Common peroneal nerve injury:

### Causes:

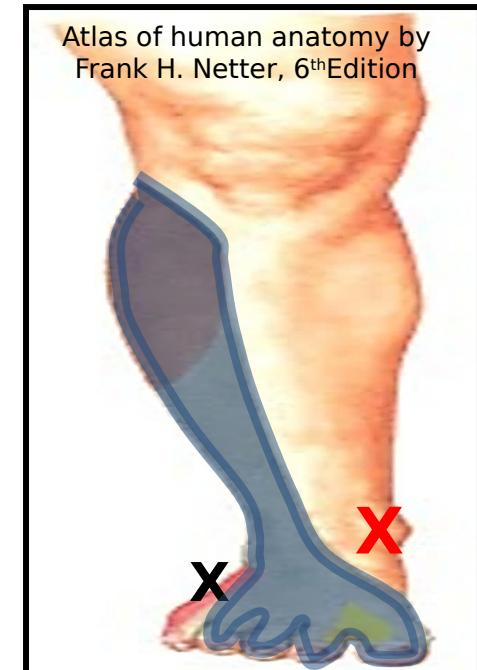
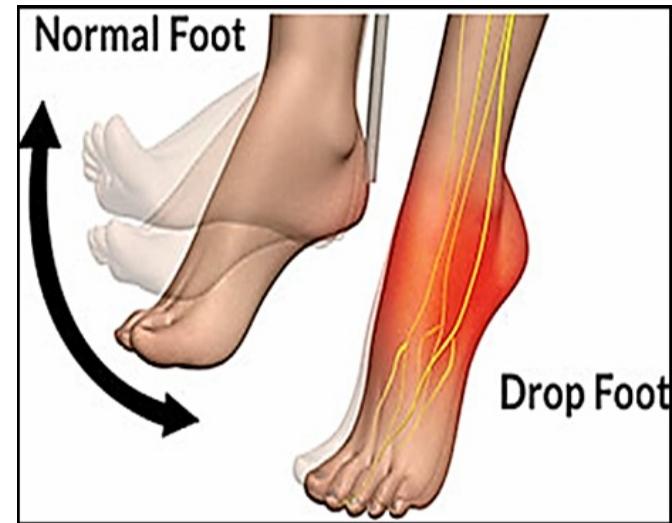
a. Fracture neck of fibula

b. Pressure from casts or splints

### Clinical picture:

**Motor effect:** Muscles of anterior and lateral compartments of leg are paralyzed, so the opposing muscles cause plantar flexion of foot (**foot drop**) and **inversion** of the foot.

**Sensory loss:** Loss of sensation on the anterior and lateral sides of the leg and dorsum of the foot and toes **except** areas supplied by sural and saphenous nerves.



# Tibial Nerve

■ **Tibial nerve:** L 4, 5 S 1, 2 & 3 ventral divisions

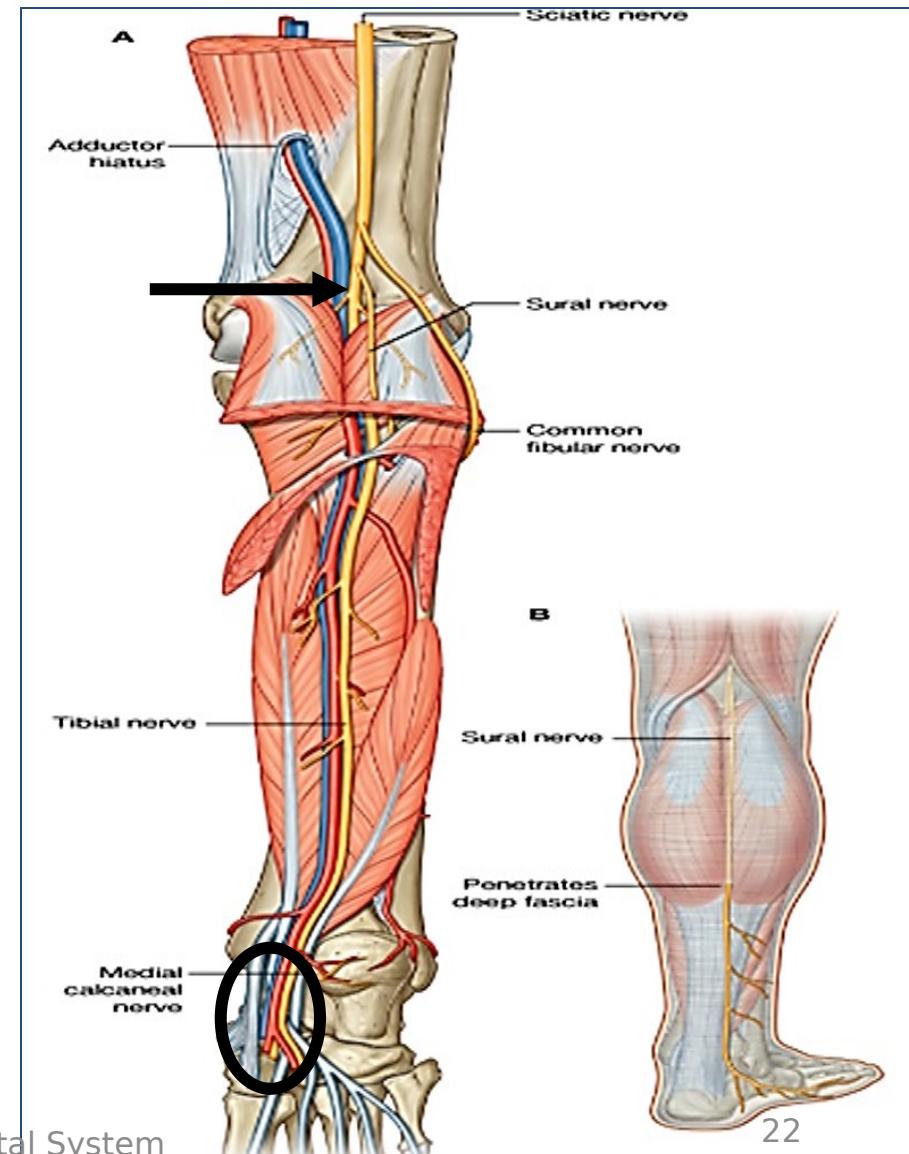
■ It is the **larger** of the 2 terminal branches of sciatic nerve.

■ It is the nerve of **posterior compartment** of the leg and sole of the foot.

■ It passes through the **tarsal tunnel** and terminates **deep** to the flexor retinaculum, midway between calcaneus and medial malleolus by dividing into:

a **Medial plantar nerve**

b **Lateral plantar nerve**



# Tibial Nerve

## Tibial nerve injury:

Because of its deep and protected position, it is rarely injured.

### Causes:

a Cut wounds of popliteal fossa

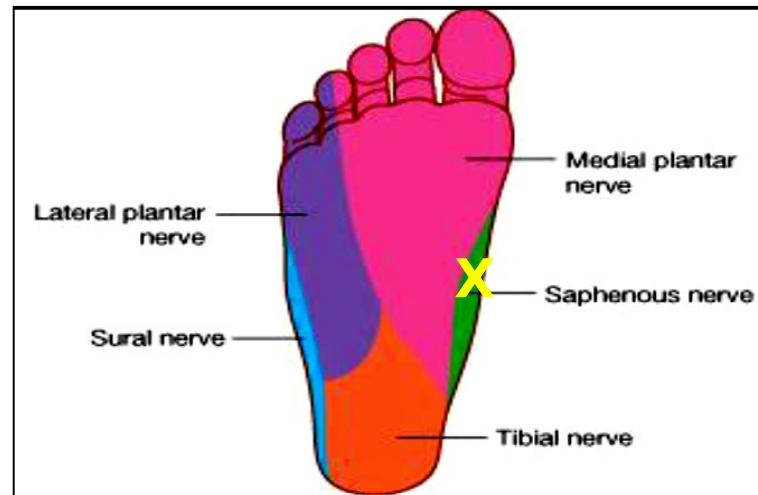
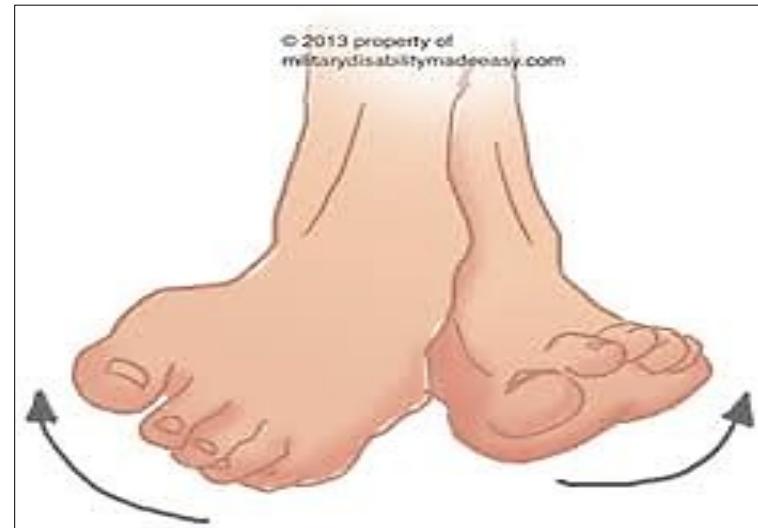
b Posterior dislocation of knee joint

C Clinical picture: Complete division results in the following clinical features:

Motor effect: All muscles in the back of the leg and sole of the foot are paralyzed, resulting in loss of plantar flexion of foot and toes and weakness of inversion of the foot.

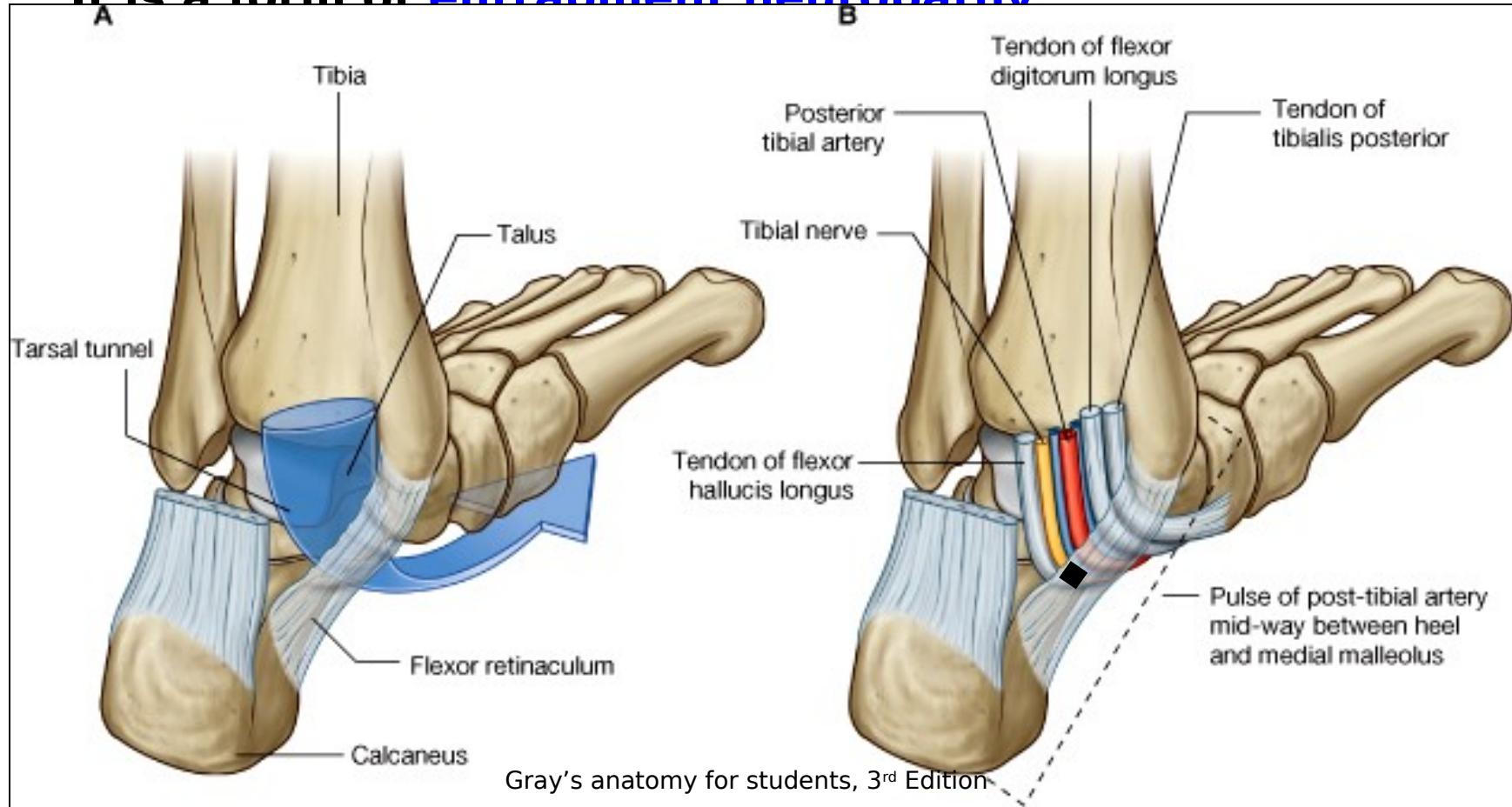
Foot is dorsiflexed and everted

Sensory loss: Loss of sensation on the sole of the foot. Later, trophic ulcers develop, except area supplied by saphenous nerve.



## Tarsal tunnel syndrome:

- Tibial nerve or one of its terminal branches (medial and lateral plantar nerves) may be **compressed** by the flexor retinaculum.
- It is a form of **entrapment neuropathy**



# Clinical Cases

- 6. A 32-year-old woman arrived at the hospital after being injured in an automobile collision. She had posterior dislocation of the hip joint.**
  - a. Which nerve is most liable to be injured?**
  - b. Mention the motor distribution of that nerve?**
- 7. If the head of the femur is dislocated postero-medially, which nerve is likely to be compressed?**
  - a. Femoral nerve**
  - b. Obturator nerve**
  - c. Nerve to piriformis**
  - d. Sciatic nerve**
  - e. Superior gluteal nerve**

# Clinical Cases

8. A 20-year-old woman with a fracture to her left upper tibia was treated with a plaster cast. A few days later she started to develop progressive numbness over the dorsum of the foot and weakness in dorsiflexion. The cast was quickly changed, and the signs were attributed to a nerve compression. **Which of the following nerves was most likely compressed?**
- a. Femoral
  - b. Common peroneal
  - c. Obturator
  - d. Sciatic
  - e. Tibial

# Clinical Cases

**9. A long-distance runner complained of swelling and pain of his shin. At physical examination, skin testing showed normal cutaneous sensation of the leg. However, muscular strength tests showed marked weakness of dorsiflexion and impaired inversion of the foot. Which nerve serves the involved muscles?**

- a. Anterior tibial**
- b. Common peroneal**
- c. Musculo-cutaneous**
- d. Obturator**
- e. Sciatic**

# Clinical Cases

**10.A 30-year-old man has numbness of the lower 1/3 of the anterolateral surface of his right leg and dorsum of his right foot when he wears tight, knee-high boots during his dance routine. Which one of the following nerves is most likely compressed?**

- a. Deep peroneal**
- b. Medial plantar**
- c. Saphenous**
- d. Superficial peroneal**
- e. Tibial**

# Clinical Cases

**11. A 40-year-old woman arrives at the hospital after being injured in an automobile collision. Her right foot is in a dorsiflexed and everted position. A nerve injury is suspected. Which of the following nerves is most likely been injured?**

- a. Deep peroneal**
- b. Femoral**
- c. Sciatic**
- d. Superficial peroneal**
- e. Tibial**

**12. Describe the motor distribution of that nerve?**

# Clinical Cases

- Answers of clinical cases from 6-12

## 6. A- Sciatic nerve

**B- Muscular branches to the long head of the biceps femoris, the semitendinosus, the semimembranosus, and the hamstring part (ischial part) of the adductor magnus. These branches arise from the tibial part of the sciatic nerve. The short head of biceps is supplied by the common peroneal part of the sciatic nerve.**

## 7. Sciatic nerve

## 8. Common peroneal nerve

## 9. Anterior tibial nerve

## 10 Superficial peroneal nerve

## 11 Tibial nerve

## 12 Muscles of posterior compartment of the leg and the sole.



- 1. Gray's anatomy for students: With student consult online access, 3<sup>rd</sup> Edition.**
- 2. Snell, clinical anatomy by regions, 9<sup>th</sup> Edition.**
- 3. Atlas of human anatomy by Frank H. Netter, 6<sup>th</sup> Edition.**
- 4. Web site: [www.studentconsult.com](http://www.studentconsult.com)**

# **Thank you**